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Begonia (Begoniaceae) from Kubah National Park and Environs, Sarawak, Borneo, including a New Species

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Summary. Seven *Begonia* species were recorded from Kubah National Park and its environs, including a new species (*Begonia matangensis* S. Julia & Kiew). Three species (*B. hullettii* Ridley, *B. propinqua* Ridley and *B. xiphophylla* Ridley) previously recorded by Ridley (1906) were re-collected and two species (*B. lailana* Kiew & Geri and *B. paoana* Kiew & S. Julia) are the new records for Kubah National Park. One species, *B. pubescens* Ridley, previously recorded by Ridley (1906), was not re-collected during the recent survey. Detailed descriptions of the species described by Ridley (1906) and the new species are provided, as well as a key for their identification. All species belong to section *Petermannia*. Following the guidelines for the IUCN categories and criteria, the conservation status of six species is assessed as 'Least Concern' and one species as 'Data Deficient'.

The Kubah National Park (NP) is located about 22 km northwest of Kuching, Sarawak, Borneo, and covers an area of 2230 hectares (Hazebroek & Abang Kassim, 2000). Kubah NP and its surrounding area are better known to botanists as Matang or Gunung (Mount) Matang. It was made famous by the Italian biologist, Odoardo Beccari, who stayed on the mountain for several months in 1866 and made extensive collections, a great many of which were new to science (Beccari, 1904). Part of this area was gazetted as a national park in 1989

and the name changed to Kubah NP (Fig. 1). The Kubah NP and environs are protected for various reasons, for example as totally protected area, water catchment, recreational areas and religious sites (Boyce & Wong, 2007).

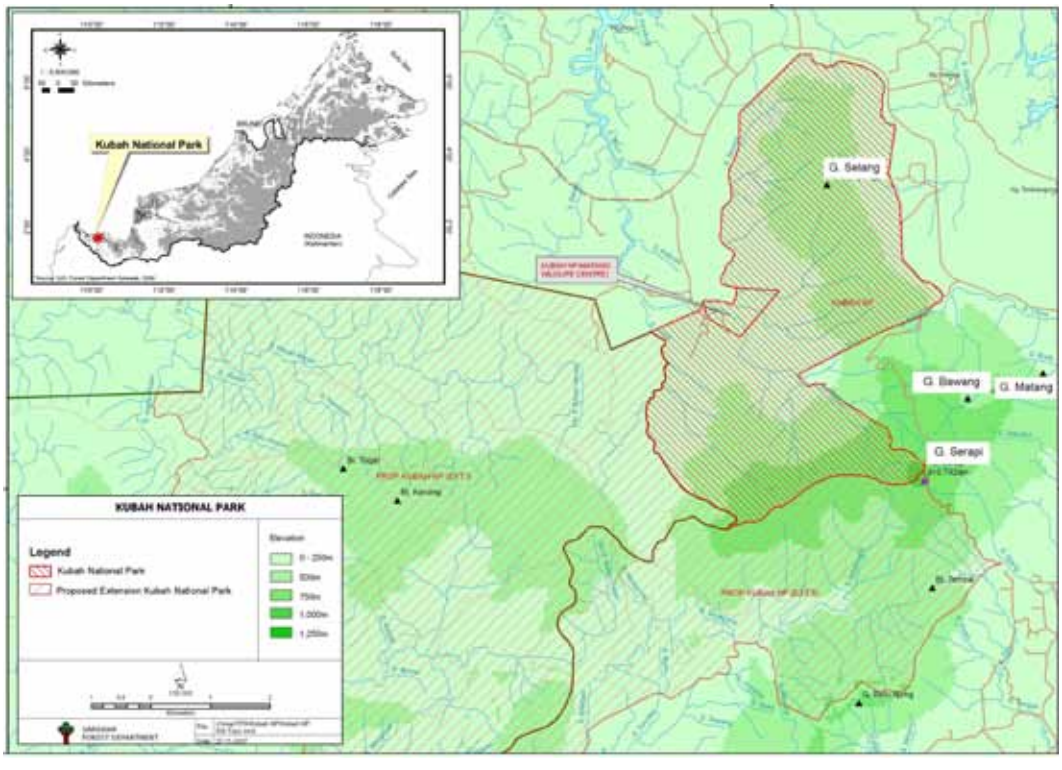

Fig. 1. Map showing Kubah National Park, Sarawak.

Since Beccari's time, most botanists have collected there, which have confirmed Beccari's observation of the 'immense variety and richness of its flora' (Beccari, 1904). For example, palms have proved particularly diverse with 100 species recorded of which 16 are endemic to the mountain, more than anywhere else of comparable size (Pearce, 1994; Pearce & Geri, 2007). Kubah NP is also rich in gingers (Poulsen, 2006) and aroids (Boyce & Wong, 2007 & 2008). Many new species have been discovered from here including several species endemic to the Kubah NP. Since the National Park is totally protected and adjacent forest is water catchment area, its flora is well protected, so endemic species found there fall within the IUCN (2001) Least Concern category.

The species richness of Kubah NP and its surrounding areas can be attributed to its very diverse topography and soil types. From about 33 m elevation it rises to mountain peaks:

Gunung Serapi, the highest at 911 m, Gunung Bawang at 500 m, Gunung Selang (396 m) and Gunung Matang. The hilly terrain is dissected by streams that cut through the sandstone punctuated by bands of hardened shale that creates picturesque waterfalls. The heavily forested slopes and ridges support lowland mixed dipterocarp forest and riverine forest near the base that are replaced higher up by hill dipterocarp forest and then ridge and summit forest. In places isolated patches of *kerangas* (tropical heath forest) occur.

The first account of begonias from the Kubah NP and its environs is that of Ridley (1906) who visited Matang in August 1905. He based his species on the specimens he collected together with those collected by G.D. Haviland, Curator of the Government Museum in Kuching 1893–1895 and R.W. Hullett, Headmaster of the Raffles School, Singapore, who collected plants in Sarawak in 1885 and 1890. Ridley described five species from Matang, four of which, *B. hullettii* Ridley (1906: 255), *B. polygonoides* Ridley (1906: 254) (later renamed *B. xiphophylla* Irmsch. (1953: 100), *B. propinqua* Ridley (1906: 249) and *B. pubescens* Ridley (1906: 254) were new to science. He also reported that *B. oblongifolia* Stapf (1894: 165), previously described from Gunung Kinabalu, Sabah, also occurred in Matang.

Since 1906, there have been no further publications on the begonias of Matang and its environs. The aim of our survey of the Kubah National Park was therefore to re-find the begonias described by Ridley (1906) which were based on very few specimens, many of which have not been re-located in herbaria. Also, to visit begonia habitats to see whether any species have been overlooked, to produce detailed species descriptions backed by a photographic record, a key to species, and more information on their habitat and abundance.

Materials and Methods

The species descriptions are based on specimens collected during various field work to Kubah National Park and the adjacent areas between 2012 and 2014 as well as the existing specimens collected over the years and deposited at Sarawak Herbarium (SAR). *Begonia pubescens* was not recollected in spite of several searches, so its description is based on the description by Ridley (1906) and examination of herbarium specimens at SAR. The measurements of other species are based on fresh specimens unless otherwise stated. The species distribution in other areas in Kuching Division is also included. Conservation assessments follow standard IUCN procedures (IUCN, 2001).

Taxonomy Treatment

Seven begonia species were recorded from Kubah National Park and adjacent areas, including one new species described below. All species belong to section *Petermannia*.

KEY TO *BEGONIA* SPECIES IN KUBAH NATIONAL PARK AND ITS ENVIRONS

1. Erect or cane-begonia 2
   Low herb 6

2. Leaves extremely narrow and long; with length: width ratio of 6:1 ..... *B. xiphophylla*
   Leaves broader than long or longer than broad with length: width ratio of 2–3:1 3

3. Leaves asymmetric and oblique ..... *B. propinqua*
   Leaves asymmetric but not oblique 4

4. All parts of the plant densely hairy ..... *B. matangensis*
   Leaves and stem sparingly pubescent 5

5. Lamina with 4–6 veins on either side of the midrib; narrow side of the lamina broader, 4–8 mm wide, more rounded; ovary broader, 12–14 mm wide; capsules with wings broadly acute proximally, truncate distally ..... *B. paoana*
   Lamina with 3 veins on either side of the midrib; narrow side of the lamina narrower, 3–3.5 mm wide, narrow side slightly falcate or straight; ovary narrower, 6–8 mm wide; capsules with wings tip distally rounded ..... *B. lailana*

6. Leaves densely hairy, almost sessile, 2–5 mm long; capsule 9–12 × 11–15 mm .... *B. pubescens*
   Leaves covered with sparse adpressed hairs, petiole 5–8 mm long; capsule 5–7 × 15–20 mm ..... *B. hullettii*

Species Descriptions

1. Begonia hullettii Ridley (1906: 255). Type: *Ridley 11776*, Borneo, Sarawak, Kuching District, Matang, August 1905 (lectotype K, here chosen). (**Fig. 2**)

Erect begonia, to 25 cm tall. Stem dull green, covered with adpressed hairs, *ca*. 5 mm thick, internodes 1.5–2 cm long, not branched, rooting at nodes on the leafless stem, succulent, slightly thicker at nodes. Stipules pale green, densely pilose, triangular, *ca*. 7 × 2 mm, margin entire, apex setose, seta to 3 mm long, caducous. Leaves alternate, slightly close, held horizontally, not oblique; petiole dull green, covered with adpressed hairs, 5–8 mm long, slightly grooved above; lamina plain, green above, paler beneath, covered with sparse adpressed hairs, plain, papery (not fleshy) in life, matt, asymmetric, slightly falcate, slightly obovate, 8–14 × 2.5–4.3 cm, narrow side 1.2–2.5 cm wide, base slightly cordate, basal lobes *ca*. 0.4 cm wide, margin finely serrate, apex acuminate, acumen 1–1.5 cm long; venation pinnate, concolorous, sparsely pilose, 3–4 veins on either side of the midrib, one vein in basal lobe, prominent both sides, stronger beneath. Plant protogynous. Inflorescences

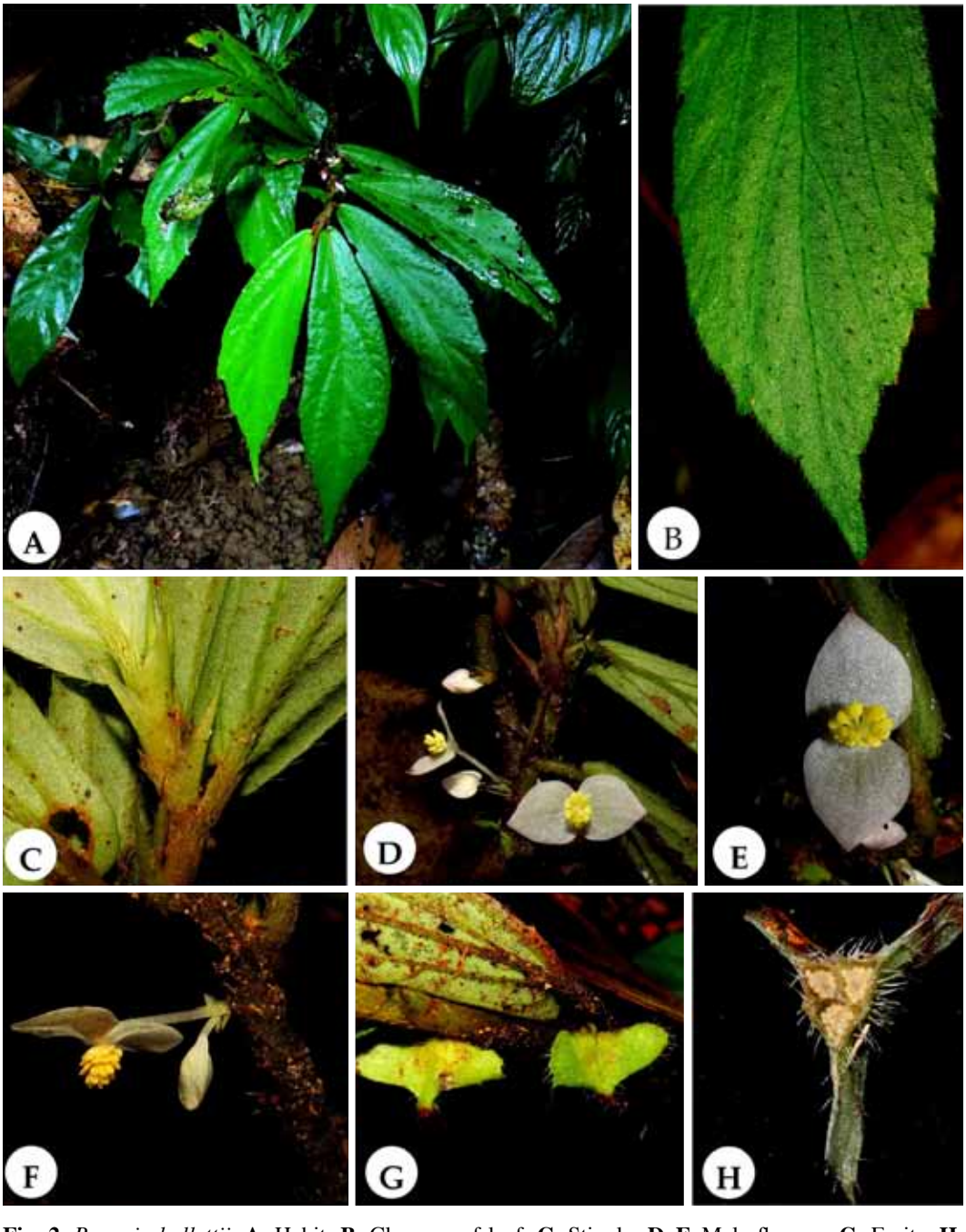

Fig. 2. *Begonia hullettii*. **A.** Habit; **B.** Close-up of leaf; **C.** Stipule; **D–F.** Male flowers; **G.** Fruits; **H.** Cross-section of fruit. All photos from *SFC 3990* by Ling Chea Yiing.

axillary along the stem, 1–4 male flowers, subsessile, glabrous, white. Bracts pale green, lanceolate, *ca*. 5 × 2 mm, margin entire, caducous. Bracteoles similar to bracts but smaller, caducous. Male flowers: pedicel white, 6–10 mm long; tepals 2, white, curved backward when fully opened, glabrous, elliptic, 6–8 × 4–5 mm, margin entire, apex acute; stamens 13–15, cluster subglobose, stalked to 0.1 mm; filaments pale yellow, *ca*. 2 mm long; anthers pale yellow, oblong, *ca*. 1 × 0.4 mm, apex emarginate. Female flower not seen. Capsules axillary along the main stem, pale green, 5–7 × 15–20 mm, sparsely pilose, locules 3, wings 3, equal, broadly acute proximally, pointed distally, 8–10mm wide, papery, sessile. Seeds barrel-shaped, 0.2–0.3 × 0.2 mm, collar cells more than half the seed length.

ETYMOLOGY. It is named after R.W. Hullett, Headmaster of the Raffles School, Singapore, who collected plants, including this species in Sarawak in 1885 and 1890.

ECOLOGY. Grows at 240–300 m elevation according to Ridley (1906), which separates it from *B. pubescens* that is recorded from higher altitudes above 500 m elevation. It grows on mossy sandstone rocks by waterfall, in seasonal streams and about 10 m from stream bank at 58–428 m elevation.

DISTRIBUTION. Borneo. Endemic to Sarawak (Kubah National Park).

CONSERVATION STATUS. Least Concern as the species occurs in the totally protected area.

SPECIMENS EXAMINED—BORNEO. SARAWAK: Kuching District: Kubah NP — Sg. Buloh, Matang Wildlife Centre, *Yahud et al. S 99928* (SAR); Matang Wildlife Centre, along the way to Rayu Waterfall, *Ling et al. SFC 3990* (SAR); along the trail to Mt. Serapi, *Ling et al. SFC 3995* (SAR); trail from Matang Wildlife Centre to Sg. Rayu, *Julia et al. SFC 4206* (SAR); Matang–Sungai China, Gunung Matang, *Burtt & Wood B2500* (SAR); Matang, *Ridley 11776* (lectotype K).

NOTES. Ridley's specimen is chosen as the lectotype because the other syntype, *Hullett s.n.*, has not been located (Hughes, 2008).

2. Begonia lailana Kiew & Geri (2003: 117). Type: *Geri et al. SBC 3753*, Sarawak, Bau, Gunung Kawa, 12 November 2002 (holotype SAR!; isotypes K!, L!, SAN!, SBC!, SING!). Synonym: *Begonia oblongifolia* Stapf *auct. non* Ridley (1906: 251). (**Fig. 3**)

Cane-like begonia up to 2 m tall. Stem reddish or greenish brown, glabrous or hispid, *ca*. 7 mm thick, internodes 3–7.5 cm long, branching near the base to form a bushy crown, succulent, slightly thicker at nodes. Stipules pale green, pubescent, lanceolate, 15–27 × 6–10 mm, margin entire, apex narrowly pointed, caducous. Leaves alternate, distant, held more or

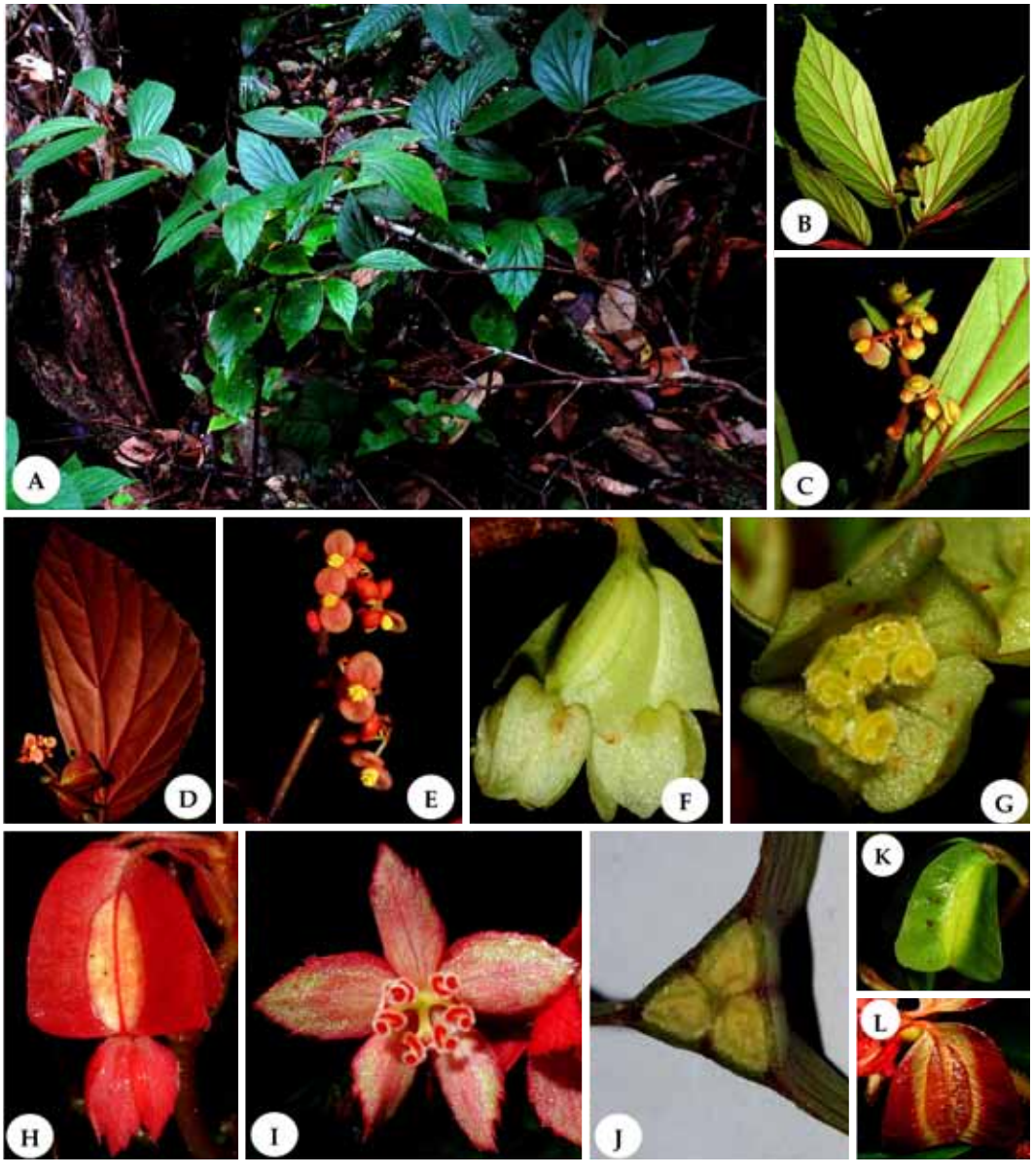

Fig. 3. *Begonia lailana*. **A.** Habit; **B.** Fruiting twig; **C.** Flowering twig; **D.** Infructescence; **E.** Male inflorescence; **F.** Female flowers (green form); **G.** Close-up of pistil; **H.** Female flower (red form); **I.** Close-up of female flower; **J.** Cross-section of ovary; **K** & **L.** Fruits (green and red forms). Photos **A**–**C** & **J** from *SFC 5508*; Photos **D** & **E** from *SFC 5507*; Photos **F**–**G** & **K** from *SFC 5501*; Photos **H**–**I** & **L** from *SFC 3985*. All photos by Ling Chea Yiing.

less horizontally, not oblique; petiole reddish, densely hirsute, 3–5 mm long in upper leaves, 8–10 mm in lower leaves, slightly grooved above; lamina silver-spotted between the veins (in juvenile), green above, pale green or reddish beneath, glabrous or with scattered red bristles on the veins and midrib, succulent in life, matt, asymmetric, broadly oblanceolate, 12.5–25 × 8–11.5 cm, narrow side 3–3.5 cm wide, slightly falcate or straight, base cuneate and subequal, basal lobes *ca*. 0.5–1 cm wide, margin minutely toothed, apex acuminate, acumen 1–1.5 cm long; venation palmate-pinnate, concolorous or sometime red beneath, bristles, 3 veins on either side of the midrib, 2 pairs in basal lobe, prominent impressed above, prominent beneath. Plant protogynous. Inflorescences axillary, erect, cymose panicle, 10–16 cm long, 1–2 female flowers on lowest node, many male flowers on upper node, peduncle to 3.5 cm long. Bracts green, lanceolate, 6–8 × 2 mm, margin entire, caducous. Bracteoles similar to bracts but smaller, caducous. Male flowers: pedicel red to pale red, 4–9 mm long; tepals 2, deep pink to pale cream and deeper pink towards the base or sometimes red, glabrous, rotund or oval, 5–8 × 7–7 mm, margin entire, apex rounded; stamens 35–38, cluster globose, stalked to 1 mm; filaments pale yellow, *ca*. 0.5 mm long; anthers pale yellow, obovoid, *ca*. 1–1.5 × 0.4 mm, apex emarginate. Female flowers: pedicel greenish or reddish, 7–9 mm long, sparsely bristles; ovary pale green with red veins on the wings or dark red, ovate, 13–18 × 6–8 mm, wings 3, equal, locules 3, placentas 2 per locule; tepals 5, pale pink to pale green or dark red outside, yellowish green inside, sparsely bristles outside, glabrous inside, obovate, 6–12 × 3–8 mm, margin minutely toothed towards the apex, apex acute; styles 3, pale yellow or pinkish, deeply Y-shaped, 2–6 mm long, divided to base; stigma yellowish or reddish, papillose forming a continuous twisted band. Capsules single or in pair on lower peduncle, green or red, 2–2.7 × 1.8–2.8 cm, glabrous, locules 3, wings 3, slightly unequal, broadly acute proximally, rounded distally, 6–11 mm wide, fibrous. Seeds barrel-shaped, *ca*. 0.4 × 0.3 mm, collar cells more than half the seed length.

ETYMOLOGY. Named in honour of the late Datuk Amar Puan Sri Dr Hajjah Laila Taib, wife of the 4th Chief Minister of Sarawak.

ECOLOGY. Lowland mixed dipterocarp forest, riverbank and at base of limestone hills in light shade.

DISTRIBUTION. Borneo. Endemic to Sarawak (Kuching Division).

CONSERVATION STATUS. Least Concern as the species is widespread in Kuching, including in the totally protected area such as Kubah National Park.

SPECIMENS EXAMINED—BORNEO. SARAWAK: Kuching District: Gunung Gading NP — waterfall trail, *Julia & Kiew SFC 3416* (SAR); Kubah NP — trail to waterfall, *Jossy et al. SFC 3218* (SAR); *Ling et al. SFC 5501* (SAR); Sg. Sendok, Matang, *Bernard S 53366* (SAR); Ulu Sg. Rayu, *Bernard S 54092* (SAR); Belian trail, *Ling et al. SFC 5508* (SAR); *Ling et al. SFC 5507* (SAR); Matang Wildlife Centre, *Ling et al. SFC 3985* (SAR); *Ling et al. SFC 3989* (SAR); Bau limestone hills — Gunung Kawa, *Geri et al. SBC 3753* (holotype

SAR!; isotypes K!, L!, SAN!, SBC!, SING!); Gunung Aup, *Malcom et al. SBC 3303* (SAR); Gunung Doya, *Raymond & Stephen SBC 3451* (SAR); *SBC 3473* (SAR); Gunung Jambusan, *Yii S 50314* (SAR); Gunung Kawa, *Meekiong SBC 3114* (SAR); Gunung Lanyang, *Julia et al. SBC 2901* (SAR); Gunung Poing, *Julia et al. SBC 353* (SAR); Serian limestone hills — Gunung Seburan, *Anderson S 25143* (SAR).

NOTES. Ridley (1906) included this species in *B. oblongifolia* originally described from Gunung Kinabalu, Sabah and he noted that it was the 'commonest species in Sarawak' and 'is somewhat variable in the form of the foliage'. Although *B. lailana* shares with *B. oblongifolia* the cane-like habit, leaves with short petioles that are not oblique, and the racemose inflorescence with a pair of fruits at the base and above, several branches above with many male flowers, it is very different from *B. oblongifolia* which has oblong leaves that are more than twice as long as wide, 10–16 × 4.5–5 cm compared with *B. lailana* that has much broader, obovate leaves, 12.5–25 × 8–11.5 cm. In addition, the stipules, lower surface of the veins and inflorescences are minutely pubescent in *B. oblongifolia*, while *B. lailana* is glabrescent.

3. Begonia matangensis S. Julia & Kiew **sp. nov.**

It most resembles *Begonia sympodialis* Irmsch. (1953: 495) in its erect, slightly woody, thin (*ca.* 2 mm wide) and hispid stems with small, narrowly lanceolate leaves that are not oblique and are slightly asymmetric with pinnate venation, a short petiole and in the sessile few-flowered inflorescences surrounded by the stipule and bracts. It is different from *B. sympodialis* in its taller branched stem to 40 cm tall (vs. to 30 cm tall and unbranched as in *B. sympodialis*), its larger leaves 8.5–15 × 2.5–3.5 cm (vs. 7–8 × 1.7–2.1 cm) with fewer veins, 4–5 veins (vs. 6–7 veins) on either side of the midrib. Type: *Julia & Geri SFC 4211*, Borneo, Sarawak, Kuching District, Kubah NP, Matang Wildlife Centre, 18 August 2013 (holotype SAR!). (**Fig. 4**)

Erect begonia to 40 cm tall. Stem brown, covered with dense white long hairs, 4–5 mm thick, internodes (0.5–)2.5–6 cm long, branched, slightly woody, thicker at nodes. Stipules greenish yellow, covered with dense long hairs, ovate, 10–17 × 5–6 mm, margin entire, apex acuminate, acumen to 0.5 mm long, persistent. Leaves alternate below, upper leaves opposite, distant, held horizontally, not oblique; petiole reddish, covered with dense long hairs, 8–12 mm long, terete; lamina plain, green above, paler beneath, densely pilose or velvety, plain, papery and soft (not fleshy) in life, matt, slightly falcate, slightly asymmetric, elliptic, 8.5–15 × 2.5–3.5 cm, narrow side 1.5–2 cm wide, base attenuate on narrow side, rounded on broad side, basal lobes rounded, 0.5–1 cm wide, margin toothed, apex acuminate, acumen 2–2.5 cm long; venation pinnate, concolorous, densely pilose, 4–5 veins on either side of the midrib, 1–2 veins in basal lobe, slightly impressed above, prominent beneath. Inflorescences protogynous, axillary, a simple cyme reduced to a single male flower on upper axil and female flower on lower axil, densely pilose. Bracts and bracteoles similar to stipules, persistent.

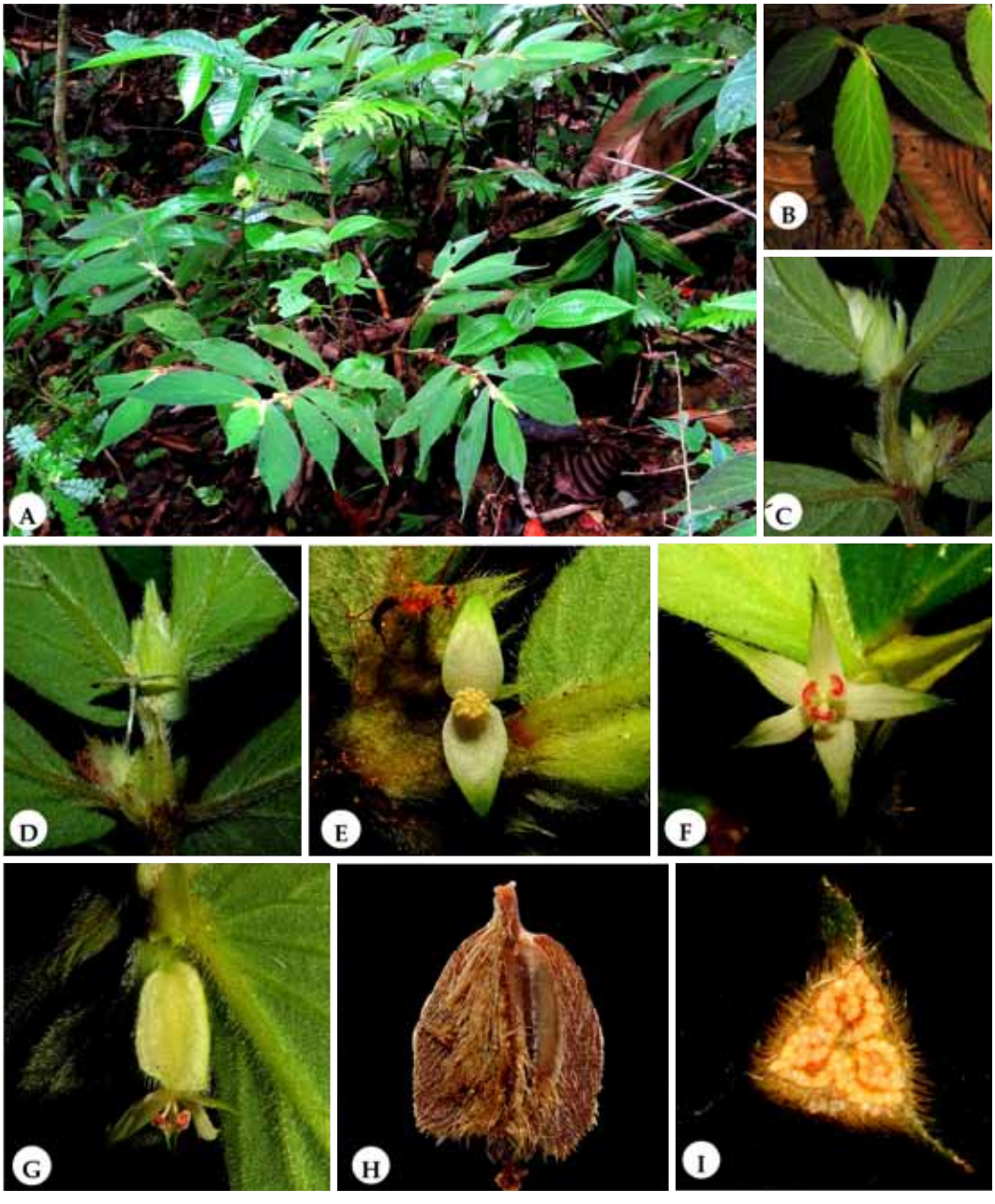

Fig. 4. *Begonia matangensis*. **A** & **B.** Habit; **C.** Stipule; **D** & **E.** Male flowers; **F** & **G.** Female flower. **H.** Old fruit; **I.** Cross-section of ovary. Photos **A–G** & **I** from *SFC 3992* by Ling Chea Yiing; Photo **H** from *SFC 4211* by Julia Sang.

Male flowers: pedicel white, 1–1.4 cm long; tepals 2, greenish towards the apex, otherwise greenish yellow, densely pilose outside, glabrous inside, ovoid, *ca*. 5 × 4 mm, margin entire, apex acute; stamens 12–15, cluster conical, stalked to 1 mm long; filaments pale yellow, *ca*. 1 mm long; anthers pale yellow, obovate, *ca*. 3 × 2 mm, apex emarginate. Female flowers: pedicel 2–3 mm long, greenish white, densely pilose; ovary greenish, oblong, 8–13 × 6–8 mm, wings 3, equal, locules 3, placentas 2 per locule; tepals 5, pale green, densely pilose outside, glabrous inside, lanceolate, 6–8 × 2–3 mm, margin entire, apex sharply acute; styles 3, pale green, widely Y-shaped, *ca*. 2 mm long, divided to base; stigma yellowish or reddish, papillose forming a continuous twisted band. Capsule single, axillary, pale green, *ca*. 10 × 8 mm, densely hairy, locules 3, wings 3, equal, acute proximally, rounded distally, 2–3 mm wide, papery; pedicel straight, very thin, 2–3 mm long, *ca*. 1 mm wide. Seeds barrel-shaped, *ca*. 0.4 × 0.1 mm, columnar cells more than half the seed length.

ETYMOLOGY. Denoting the locality where it grows.

ECOLOGY. Lowland mixed dipterocarp forest growing by seasonal streams or on the edge of forest on semi-exposed gentle slopes at 36 m elevation.

DISTRIBUTION. Borneo. Endemic to Sarawak (Matang Wildlife Centre).

CONSERVATION STATUS. Least Concern. Although it is known from one locality, it falls within the Least Concern category because it grows within a totally protected area.

SPECIMENS EXAMINED—BORNEO. SARAWAK: Kuching District: Kubah NP — Matang Wildlife Centre, *Ling et al. SFC 3992* (SAR); Kubah NP, Matang Wildlife Centre, *Julia & Geri SFC 4211* (holotype SAR!).

NOTES. This species is very localised and was found only in one location in the Matang Wildlife Centre. In its hairiness, it resembles *B. pubescens* but it can be distinguished from *B. pubescens* by its tall, erect stem, conspicuous internodes and narrower leaves.

4. Begonia paoana Kiew & S. Julia (2007: 217). Type: *Julia, Kiew & Geri S 91390,* Borneo, Sarawak, Kuching Division, Gunung Rimo, 29 April 2006 (holotype SAR!). (**Fig. 5**)

Cane-like begonia up to 1.2 m tall. Stem reddish brown, minutely pubescent, 3–4 mm thick, internodes 3–13.5 cm long, branching, woody, slightly thicker at nodes. Stipules pale green, glabrescent, lanceolate, 16–35 × 6–10 mm, margin entire, apex attenuate, caducous. Leaves alternate, distant, held more or less horizontally, not oblique; petiole brownish red, minutely pubescent, 6–10(–20) mm long in upper leaves, 5–10(–18) mm in lower leaves, terete; lamina plain, mid-green above, paler beneath, glabrous or with sparse minute red hairs, succulent in life, glossy, asymmetric, broadly ovate, 15–24 × 4.5–11 cm, narrow side 4–8

cm wide, base rounded on the broad side, cuneate or rounded on the narrow side, basal lobes 0.5–1 cm wide, margin minutely dentate, apex acuminate, acumen *ca*. 1 cm long; venation palmate-pinnate, concolorous, glabrous or minutely pubescent, 4–6 veins on either side of the midrib, 2–3 veins in basal lobe, prominent impressed above, slightly prominent beneath. Plant protogynous. Inflorescences axillary, erect, racemose with cymose branches of male

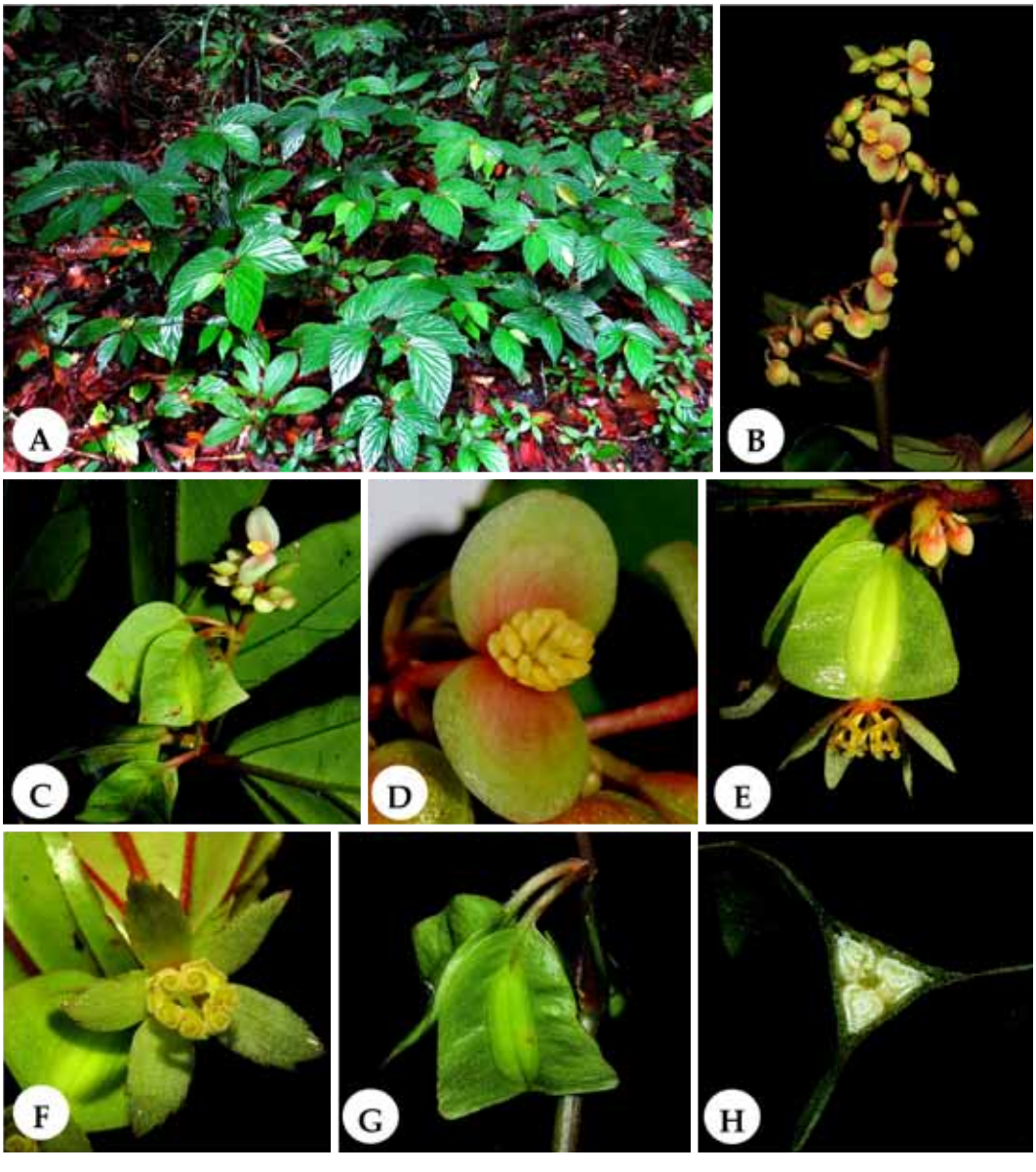

Fig. 5. *Begonia paoana*. **A.** Habit; **B.** Male inflorescence; **C.** Fruits and male inflorescence; **D.** Male flower; **E** & **F.** Female flower; **G.** Fruit; **H.** Cross-section of fruit. All photos from *SFC 5510* by Ling Chea Yiing.

flowers, (3–)11–25 cm long, 1–2 pairs of female flowers on lowest node, many male flowers on upper node, peduncle to 3.5 cm long. Bracts pale green, lanceolate, *ca*. 7 × 3 mm, margin entire, caducous. Bracteoles similar to bracts but smaller, caducous. Male flowers: pedicel red, 6–7 mm long; tepals 2, pale green flush crimson, glabrous, round with recurved margin, 5–7 × 5–7 mm, margin entire, apex rounded; stamens *ca*. 40, cluster conical, subsessile; filaments pale yellow, *ca*. 0.75 mm long; anthers pale yellow, oblanceolate, *ca*. 1 × 0.3 mm, apex rounded. Female flowers: pedicel pale red, 7–8 mm long, sparsely pubescent; ovary pale red or green, ovate, *ca*. 15 × 12–14 mm, wings 3, equal, locules 3, placentas 2 per locule; tepals 5, greenish yellow, glabrous, oval or ellipsoid, 10–11 × 4–6 mm, margin distantly toothed towards the apex, apex acute; styles 3, pale yellow, widely Y-shaped, 3–4 mm long, divided to base; stigma yellowish, papillose forming a continuous twisted band. Capsules 1–2 pairs on lower peduncle, green, 2–2.8 × 2.1–2.5 cm, glabrous, locules 3, wings 3, subequal, broadly acute proximally, truncate distally, 6–8 mm wide, fibrous; pedicel pendent, 10–22 mm long. Seeds barrel-shaped, *ca*. 0.25 mm across, collar cells more than half the seed length.

ETYMOLOGY. Named in honour of Joseph Pao Chiong Chai, botanical artist in the SAR Herbarium and Sarawak Forestry Corporation (1983–present).

ECOLOGY. Lowland mixed dipterocarp forest, on riverbanks and on the slopes up to limestone hills, also on limestone screes, rubble or rocks at 65–280 m altitude.

DISTRIBUTION. Borneo. Endemic to Sarawak (Kuching Division).

CONSERVATION STATUS. Least Concern. Widespread, including within a totally protected area (Kubah NP).

SPECIMENS EXAMINED—BORNEO. SARAWAK: Kuching District: Kubah NP — Waterfall Trail, *Ling et al. SFC 5502* (SAR); *SFC 5510* (SAR), along Kubah NP boundary, near Gunung Selang, *Ling SFC 4212* (SAR); Matang — Gunung Matang, *Julia S 99386* (SAR); Gunung Serapi, *Yahud et al. S 103419* (SAR); Sungai Cina Recreational area, *Julia et al. SFC 4208* (SAR); *SFC 4209* (SAR); Bau — Siniawan, Gunung Peninjau, *Julia et al. SFC 3421* (SAR); Seburan, *Anderson S 12921* (SAR); Padawan — Gunung Rimo, *Julia, Kiew & Geri S 91390* (holotype SAR!); Sungai Bengoh, *Ling et al. SFC 1811* (SAR); Bukit Manok, *Mamit S 33476* (SAR); Temurang, *Julia et al. S 105586* (SAR); *S 105091* (SAR); Tiang Bekap, *Mamit S 32641* (SAR); Gunung Rimo, *Julia et al. S 91390* (SAR); Serian – Gunung Selebor, *Anderson S 20827* (SAR); *Ilias S 28053* (SAR); *Julia & Kiew S 95676* (SAR); Bukit Peyang, *Yii & Othman S 46218* (SAR); Tebakang, Bukit Alak, *Dayang Awa & Ilias S 45200* (SAR); Gunung Bakat, *Dayang Awa & Ilias S 45848* (SAR); *S 45815* (SAR); Tebedu, *Ling et al. SFC 639* (SAR).

5. Begonia propinqua Ridley (1906: 249). Type: *Ridley 11771,* Borneo, Sarawak, Matang, August 1905 (lectotype K, here chosen; isolectotype BM). (**Fig. 6**)

Cane-like begonia to 0.4–2 m tall. Stem reddish-brown, sometimes green, lenticellate, glabrous, *ca*. 6 mm thick, slightly ridged, much branched, succulent, internodes 6–8 cm long, slightly thicker at nodes. Stipules pale green, glabrous, broadly lanceolate, 1.8–3 × 0.6–0.8 cm, keeled, margin entire, apex setose, seta to 2–15 mm long, caducous. Leaves alternate, distant, held horizontally, oblique; petiole reddish-brown, glabrous, 7.5–16 cm long, terete; lamina plain, pale green, paler beneath, glabrous, fleshy and sticky in life, matt, asymmetric, ovate, 9–20 × 9–16.5 cm, narrow side 4.5–6.5 cm wide, base cordate, basal

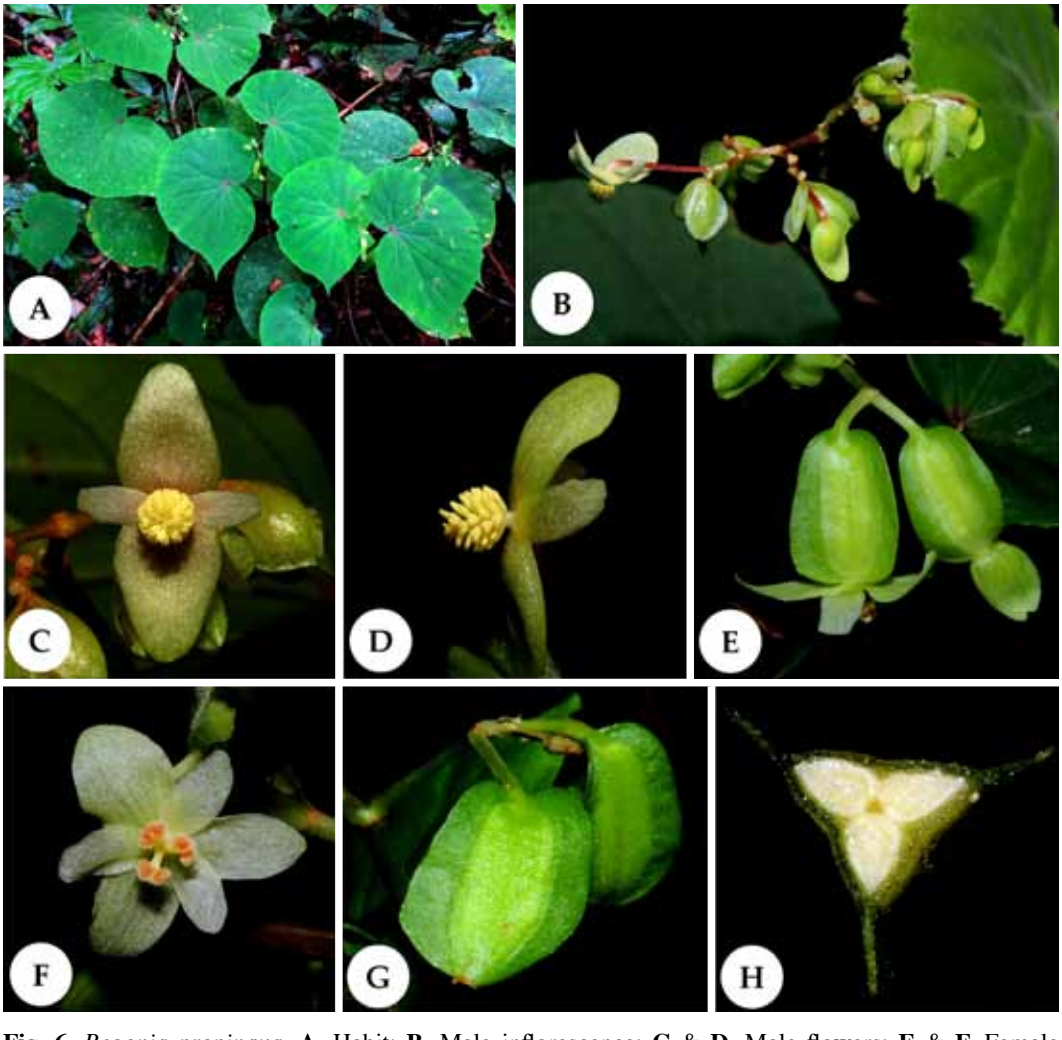

Fig. 6. *Begonia propinqua*. **A.** Habit; **B.** Male inflorescence; **C** & **D.** Male flowers; **E** & **F.** Female flowers; **G.** Fruits; **H.** Cross-section of fruit. Photo **A** from *SFC 3987*; Photos **B** & **D**–**G** from *SFC 5516*; Photo **C** from *SFC 4207*; Photo **H** from *SFC 3986*. All photos by Ling Chea Yiing.

lobes 3.5–8 cm wide, margin dentate at vein endings, finely toothed in between or rarely entire, apex acuminate, acumen 2–2.5 cm long; venation palmate-pinnate, veins concolorous or reddish-brown at base, glabrous, 3–5 veins on either side of the midrib, 4–5 veins in basal lobe, slightly sunken above, prominent beneath. Plant protogynous. Inflorescences axillary on upper leaf axils, erect, paniculate, 13–26 cm long with 1–3 pairs of female flowers at top of peduncle and above 2–3 branches with male flowers, peduncle glabrous, 4.5–7 cm long. Bracts pale green, ovate, 6–12 × 6 mm, margin entire, caducous. Bracteoles similar shape to bracts but smaller, caducous. Male flowers: pedicel greenish red or pinkish, 4–8 mm long; tepals 4, outer 2 tepals whitish, glabrous, ellipsoid, *ca*. 10 × 5 mm, margin entire, apex acute; inner 2 tepals white, glabrous, narrowly ellipsoid, *ca*. 5 × 2–3 mm, margin entire, apex acute; stamens 41–50, pale yellow, cluster globose, subsessile; filaments yellow, *ca*. 0.3 mm long; anthers yellow, oblanceolate, *ca*. 1 × 0.3–0.4 mm, apex emarginate. Female flowers: pedicel pinkish or green, 6–10 mm long, glabrous; ovary pale green, oblong, 1–1.2 × 1–1.4 cm, wings 3, equal, locules 3, placentas 2 per locule; tepals 5 or 6, whitish tinged greenish, glabrous, elliptic, 10–12 × 5 mm, margin entire, apex acute; styles 3, yellowish, shallow Y-shaped, *ca*. 2 mm long, divided to base; stigma orange-yellow or pinkish, papillose forming a continuous twisted band. Capsules 1–3 pairs on lower peduncle, green or green tinged red, 1–1.5 × 0.8–1.5 cm, glabrous, locules 3, wings 3, equal, rounded proximally and distally, 3–4 mm wide, thinly fibrous; pedicel pendent, 8–10 mm long. Seeds barrel-shaped, *ca*. 0.3 × 0.2 mm, collar half the seed length.

ETYMOLOGY. *propinqua* means ‘neighbour’, perhaps so-called because it grows in places where other begonias are found such as Kubah National Park.

ECOLOGY. Lowland to hill mixed dipterocarp forests on very steep slopes and above rocky stream bank at 35–497 m elevation. Ridley (1906) noted that this species was common in woods in Kuching.

DISTRIBUTION. Borneo. Endemic to Sarawak.

CONSERVATION STATUS. Least Concern. The species is widespread in the Kuching Division, including in totally protected area.

SPECIMENS EXAMINED—BORNEO. SARAWAK: Kuching District: Matang — Sungai Cina Recreational Park, *Julia et al. SFC 4207* (SAR); Gunung Matang, *Julia et al. SFC 4201* (SAR); Matang, *Ridley 11771* (lectotype K; isolectotype BM); Kubah NP — Matang Wildlife Centre, Senduk Waterfall, *Ling SFC 4214* (SAR); *SFC 3984* (SAR); *SFC 3986* (SAR); *SFC 3987* (SAR); *SFC 3988* (SAR); waterfall trail, *Ling et al. SFC 5501* (SAR); main trail to Gunung Serapi, *Yahud et al. S 103643* (SAR); *Ling et al. SFC 3997* (SAR); Rayu trail, *Jossy et al. SFC 3206* (SAR); Gunung Selang, *Bernard S 53817* (SAR); Sungai Rayu, *Yahud et al. S 100640* (SAR); Bau — Sungai Adis, *Ling et al. SFC 5516* (SAR).

NOTES**.** The lectotype is selected here because the other two syntypes collected by Hullett and Haviland have not been located. This begonia is unusual because its leaves and inflorescences are sometimes sticky to touch in life. The leaves of juvenile plants are bronzy.

6. Begonia pubescens Ridley (1906: 254). Type: *Haviland 76,* Borneo, Sarawak, Kuching District, Matang (lectotype K, here chosen).

Low erect herb, 5–10 cm tall or decumbent. Stem densely pubescent, *ca*. 4 mm thick, internodes 0.5–1 cm long. Stipules densely pubescent, lanceolate, 8–12 × 3–5 mm, keeled, margin entire, apex pointed, persistent. Leaves alternate, crowded, not oblique; petiole densely pubescent, 2–5 mm long, terete; lamina reddish beneath, densely pubescent on both surfaces and margin, thinly papery when dried, slightly falcate, asymmetric, obovate to oblanceolate, 5.5–10.5 × 2.5–4.5 cm, narrow side 0.8–1.7 cm wide, base slightly rounded or cuneate, basal lobes inconspicuously developed, margin irregularly minutely toothed on the upper half, apex acute to acuminate, acumen *ca*. 1 cm long; venation pinnate, 3–4 veins on each side of midrib, prominent on both surfaces. Plant protogynous. Bracts lanceolate, *ca*. 6 mm long. Male inflorescence racemose on upper leaf axil, *ca*. 3 cm long, peduncle *ca*. 0.7 cm long. Male flower on a slender pedicel, 5–14 mm long; tepals white, oval, 3–8 × 7–8 mm; stamens *ca*. 12, filaments white, free nearly to the base; anthers yellow, oblong oblanceolate, apex emarginate. Female flower not seen. Capsules axillary along the stem, single, 9–12 × 11–15 mm, beaked, hairy on the edge of wings; locules 3; wings 3, unequal, rounded proximally and distally, 3–7 mm wide, dehiscing between the locule and wing; pedicel erect, 3–4 mm long.

ETYMOLOGY. It is named for its very hairy nature.

ECOLOGY. On sandstone cliff faces at 540 m elevation. According to Ridley (1906), the species is abundant in Matang at 548 m elevation.

DISTRIBUTION. Borneo. Endemic to Sarawak (Kuching District).

CONSERVATION STATUS. Data Deficient. Because this species was not re-located, the exact site where it was collected is unknown, so it is not certain whether it falls within the national park boundary. In addition, the size of its population and the stability of its habitat are also unknown.

SPECIMENS EXAMINED—BORNEO. SARAWAK: Kuching District: Matang — Gunung (Mt.) Matang, *Burtt & Woods B 1958* (SAR); *Anderson S 25108* (SAR); Matang, *Haviland 76* (lectotype K); Gunung Serapi, *Yahud et al. S 92634* (SAR).

NOTES. Among the three syntypes cited by Ridley (1906), *Hullet 346* was not located and between the Ridley and Haviland specimens, *Haviland 76* is more informative because it shows male flowers and fruits clearly.

Ridley (1906) noted that the species is 'closely allied to *B. hullettii* but differs in its hairiness, shorter broader leaves and beaked hairy capsule'. On Gunung Serapi, the two species appear to be separated altitudinally with *B. pubescens* at 548 m and *B. hullettii* lower down below 300 m altitude.

It was the first species to be described from the group of short, usually unbranched begonias with short petioles, non-oblique rather small leaves that are only slightly asymmetric, and have few-flowered, almost sessile inflorescences or solitary flowers produced from the leaf axils, simultaneously from the bottom to the top of the stem. It is not surprising, therefore, that this name has been applied in herbaria for several similar, but as yet un-named species, e.g., for the specimens from Gunung Mulu cited by Hughes (2008). *Begonia pubescens* is characterised by its short stature with crowded, small leaves that are wedge-shaped on the broad side and closely dentate towards the apex. As its name suggests, it is densely hairy. The few other specimens that match this description are listed above.

7. **Begonia xiphophylla** Irmsch. (1953: 100). Type: *Ridley 11770*, Borneo, Sarawak, Matang, August 1905 (lectotype K). Synonym: *B. polygonoides* Hook.*f.* in Oliver, *auct. non B. polygonoides* Ridley (1906: 254). (**Fig. 7**)

Erect begonia 20–45 cm tall. Stem brownish red, glabrous, *ca.* 5 mm thick, internodes 1–2 cm long, little-branched, slightly woody, thicker at nodes. Stipules pale green, glabrous, triangular, 5–8 × 3 mm, margin entire, apex acute, caducous. Leaves alternate, distant, held horizontally, not oblique; petiole reddish-brown, glabrous, 0.6–1 cm long, slightly grooved above; lamina plain green above, paler beneath, glabrous, slightly succulent in life, glossy, symmetric, sometime slightly falcate, narrowly lanceolate, 11–23 × 1.8–2.6 cm, narrow side 0.8–1.2 cm wide, base broadly acute, basal lobe scarcely developed, margin toothed with slightly reddish margin, apex pointed; venation pinnate, concolorous, glabrous, 2–3 veins on either side of the midrib, ascending steeply to the margin, slightly prominent on both surfaces. Plant protogynous. Inflorescences axillary in upper leaf axils, cymes, the 1st branch with 2 female flowers on the lower part and a male flower terminal, *ca.* 4.5 cm long, 2 branches each 2–2.5 cm long. Bracts pale green, triangular, *ca.* 5 × 3 mm, margin entire, caducous. Bracteoles similar to bracts but smaller. Male flowers: pedicel pinkish, 4–6 mm long; tepals 4, outer 2 tepals pinkish, glabrous, almost rounded, *ca.* 5 × 4 mm, margin entire, apex rounded; inner 2 tepals pinkish, glabrous, linear, *ca.* 5 × 2 mm, margin entire, apex acute; stamens *ca.* 30, cluster subglobose, stalked to 1 mm long; filaments pale yellow, *ca.* 0.5 mm long; anthers pale yellow, oblanceolate, *ca.* 1 × 0.3 mm, apex emarginate. Female flowers: pedicel pinkish, 5–12 mm long, glabrous; ovary pale green sometime tinged red,

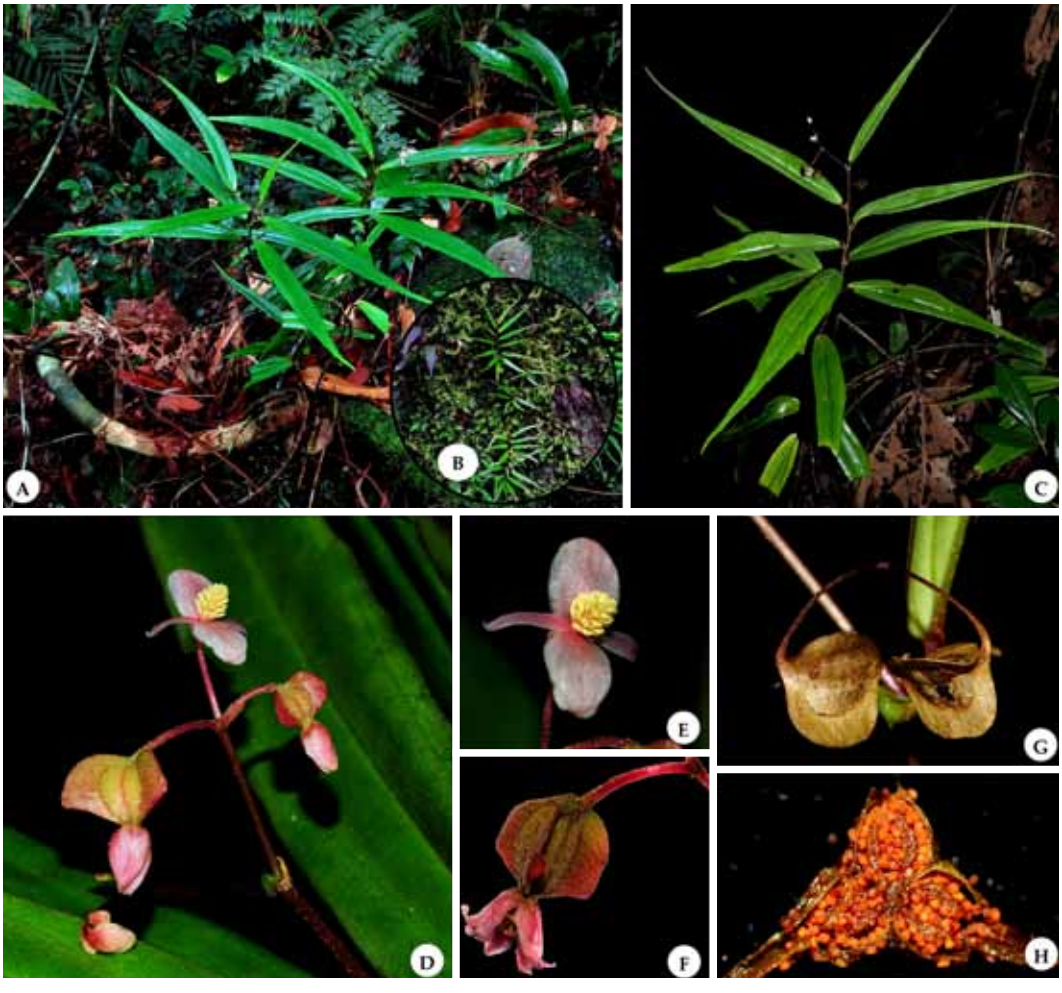

Fig. 7. *Begonia xiphophylla*. **A–C.** Habit; **D.** Inflorescence; **E.** Male flower; **F.** Female flower; **G.** Fruits; **H.** Cross-section of fruit. All photos from *SFC 3998* by Ling Chea Yiing.

ovoid, 4–6 × 2–4 mm, wings 3, subequal, locules 3, placentas 2 per locule; tepals 5, pinkish, outer tepals elliptic, 5–6 × 4 mm, inner tepals narrowly elliptic, *ca*. 4 × 2 mm, margin entire, apex acute; styles 3, pale green, wide Y-shaped, *ca*. 2 mm, divided to base; stigma brownish, papillose forming a continuous twisted band. Capsules single or in pair, reddish green, *ca*. 8–10 × 10–14mm, glabrous, locules 3, wings 3, subequal, acute proximally, rounded distally, 2–3 mm wide, papery; pedicel pendent, 1–1.5 cm long, thread-like. Seeds barrel-shaped, *ca*. 0.2 × 0.1 mm, collar cells more than half the seed length.

ETYMOLOGY. Its name commemorates its remarkably narrow leaves; Greek, *xipho* = narrow; *phyllus* = leaf.

ECOLOGY. Hill forest on large mossy sandstone boulders in deep shaded area above 650 m elevation. Very localised.

DISTRIBUTION. Borneo. Endemic to Sarawak (Kubah National Park).

CONSERVATION STATUS. Least Concern as the species is well protected within the Kubah National Park.

SPECIMENS EXAMINED—BORNEO. SARAWAK: Kuching District: Kubah NP — near main trail to Mt. Serapi, *Ling et al. SFC 3998* (SAR); Matang — Bukit Tanduk, *Bernard S 54032* (SAR); Gunung Serapi, *Yahud et al. S 92640* (SAR); Matang, *Ridley 11770* (lectotype K).

NOTES. It is a striking species characterised by its extremely narrow symmetric leaves with ascending veins that reach halfway or more up the lamina, the margin that has distant conspicuous teeth, and the fine panicle with very small male flowers and small fruits that are round in outline. In the Sarawak herbarium, a few specimens with similar narrow leaves collected from other localities outside Kuching District have been identified as *B. xiphophylla* but more complete material is needed to determine whether these specimens correctly belong to *B. xiphophylla*. Hughes (2008) stated that the syntype, *Haviland 1906* has not been located, so the other syntype, *Ridley 11770* is here designated as the lectotype.

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